SAS has been working with real time sensor data collected from the power transmission grid to gain insight into the dynamic operation and stability of the wide area network. The project has focused on real-time capturing and cleansing of the Phasor Measurement Unit (PMU) data, as well as utilizing advanced analytic techniques for base-lining, event detection, event classification, and event impact. The initial phase involved setting up methods to pull data from the PMUs, analyzing the data for data quality issues and establishing automated data cleansing schemes so the data is always ready for analysis. The PMU measurements were based-lined for steady state and used to project real-time forecasts. This allows immediate detection of events on the system, in addition to minimizing false positives. When events are detected, time-series machine learning techniques are used to classify the event (i.e. momentary line trip, generator trip, equipment issue, etc.). Analysis is then performed to determine the impact of the event on system stability. This presentation provides an overview of the end-to-end process to provide context and then provides details on the advanced times-series machine learning techniques used for classifying the events.